

REMARKS/ARGUMENTS

This timely filed Reply is in response to the Office Action dated July 27, 2005.

Claims 1, 6, 9, 10 and 18 are rejected under 35 U.S.C. § 102(b) as being anticipated by Garg (U.S. 6,048,577). Claims 8, 19-21, 31-34, and 36-37 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Garg as applied to claim 1, and further in view of Li et al. (US 6,458,017). Claims 2, 3, 4, 5, 22, 23, 24, 25, and 30 are objected to as being dependent upon a rejected base claim, but would allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In this Reply, claims 1, 4-6, 8, 17 and 19 have been amended and claim 18 has been cancelled. Support for the "pore size of said nanoporous comprising particles ranges from 0.21 nm to 30 nm" limitation now recited in amended claim 4 can be found on page 29, lines 11 and 12 of Applicants' application. No new matter has been added.

Before reviewing claim rejections based on cited art, Applicants will first review the claimed invention as now recited in amended claim 1. As amended, claim 1 recites a slurry for chemical mechanical polishing (CMP) comprising a bulk solution, a plurality of particles, wherein the particles are *nanoporous* comprising particles. Prior to the current amendment to claim 1 the recited particles were nanosize nanoporous comprising particles. Accordingly, the amendment to claim 1 only eliminates the nanosize particle limitation.

Applicants respectfully note that nanoporous and nanosize are different terms which appears to have been treated as synonomous terms by the examiner in the Office Action. Although a given particle can be both nanosize and be nanoporous, nanosize particles can clearly be, and are generally non-porous particles. Nanoporous particles are particles having a plurality of pores which are generally significantly smaller than the particle size, such as 0.21 nm to 30

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nm pore sizes as disclosed by Applicants as noted above. The pores are generally created inside the particle during the synthesis process as disclosed on Applicants' application. In contrast, the size of the nanoporous particles can range from anywhere from nanodimensions (> 5 nm) up to 1 micron size.

Nanosized particles for slurries are known, as evidenced by the Garg reference identified by the Examiner. However, Applicants are unaware of any disclosed slurries having nanoporous particles.

Nanoporous particles are described in Applicants' application in several places, including Figs. 6(a)-(c) which show TEMs of nanosize nanoporous core particles. The nanoporous particles are about 50 nm as shown in Fig. 6(a), about 80 to 100 nm as shown in Fig. 6(b) and about 120-160 nm as shown in Fig. 6(c). Page 31, paragraph 3, which is copied below, also describes nanoporous particles.

Nano-porous silica particles can be formed by a modified Stober process (W. Stober, A. Fink, E. Bohn, J. Colloids and Interfacial Science, 26, 62-69 (1968)). The particle size can vary from 200 nm to 500 nm, while the porosity can vary from 10 to 60 %. As the porosity of the surface increase the number of adsorption sites are expected to increase. Figure 6 shows TEM photographs showing different sizes of nanoporous core particles. The particles are mono-dispersed and spherical in nature. It is noted that the aspect ratio of particles can be changed using alternate formation methods.

Nanoporous coating are also disclosed by Applicants on page 37, lines 5-18:

A preferred embodiment of the invention uses silica or silica inorganic cores coated with surfactants to form a hard core-soft shell structure. The inorganic core can be silica, doped silica, porous silica, or hard particle (Mohs hardness greater than 3.0) coated with silica, doped silica, or a porous silica layer. For silica/nanoporous or silica/nanoporous silica coated inorganic cores the preferred surfactant is cationic, zwitterionic, or a mixture of cationic/non-ionic surfactant or with a cationic surfactant with generally less than 1% of an anionic additive. Examples of preferred cationic based surfactants for silicon dioxide include CTAB, and CTAC, and their derivatives and chemical equivalents. The carbon chain length in the surfactant molecule is preferably from 8 to 20. Other examples of preferred surfactants for silicon dioxide include zwitterionic surfactants, such as KETJENLUBE 522[®]. The concentration of the surfactant can be from 0.1 of a bulk critical micelle concentration (CMC) of the solution to 1000 times CMC. Preferably, the surfactant concentration is from 0.4 of the CMC to 100 times CMC.

The bulk CMC value of the surfactant is defined as the minimum concentration at which the surfactant self assembles to form structured layers in a bulk solution.

The claimed nanoporous slurry particles provide unexpected and highly advantageous results, particularly when used in conjunction with Applicants' selective adsorption additive comprising slurry. Specifically, in this arrangement, because of the porous particle surface, the adsorption of surfactants or polymer additives can occur at different, and generally lower, concentrations as compared to bulk particles.

Now turning to the cited art, according to the Examiner regarding Garg:

Garg teaches nano-sized powder of alpha alumina having silica coating thereon (column 5, lines 7-10). Garg further teaches a polishing slurry is comprised of a alumina powder has a silica coating wherein 95% of the particles have widths of from 20 to about 50 nanometers while less than 5% have particle sizes greater than 100 nanometers and is dispersed in a liquid dispersion medium (claims 6 and 9). The aforementioned reads on,

A slurry for chemical mechanical polishing (CMP), comprising:
a bulk solution; and
a plurality of nanoporous comprising particles, **in claim 1**;
wherein said nanosize nanoporous particles comprise nanoporous cores coated with a solid material coating or first core material coated with a second material, and second material being a nanoporous coating, **in claim 6**; and
wherein nanosize nanoporous particles comprising particles comprise a first core material coated with a second material, and second material being a nanoporous coating, **in claim 18**.

The said above encompasses an average particle size of said nanosize nanoporous comprising particles is less than 500 nm, **in claim 9** and is from 200 to 500 nm, **in claim 10**.

Applicants respectfully disagree with assertions regarding Garg relating to porous particles. Garg is entitled "Nano-sized alpha alumina particles having a silica coating thereon" and discloses nano-sized powders of alpha alumina can be obtained from a boehmite gel doped with a barrier-forming material such as silica that is then dried, fired and comminuted to powder form. The only mention of porosity in Garg regarding porosity is in the background regarding "porous nature of the boehmite particles" as copied below:

One of the problems in working with a boehmite gel to produce formed ceramic articles is that the gel cannot exceed about 65 wt % solids because of the porous nature of the boehmite particles. Thus there is a lot of water that needs to be driven off in the course of the drying process. In addition not only is there further shrinkage as a result of the elimination of the water associated with the boehmite, (which is of course alpha alumina monohydrate), but the phase change from the intermediate gamma phase (to which the boehmite first converts) to the final alpha phase also involves a shrinkage. Thus the direct fabrication of a ceramic product from boehmite is only practical for thin objects where the water loss can be relatively easily be accommodated and the shrinkages can be controlled.

The Examiner asserts that col. 5, lines 7 -10 disclose nanoporous particles. Applicants have copied col. 5 lines 7-16 of Garg below to demonstrate that col. 5, lines 7 -10 does not disclose nanoporous particles :

The silica can be added in the form of colloidal silica, a silica sol or a compound that under the reaction conditions will liberate such a colloid or sol and form a glassy coating around the alumina particles. Such compounds could include organosilanes such as tetraethyl orthosilicate, and certain metal silicates. Generally alkali metal silicates are less preferred. The form of the silica in the sol should preferably be of a particle size that is at least similar to, or preferably smaller than, that of the boehmite, that is, of the order of a few nanometers at most.

Accordingly, in view of the above, Applicants submit amended claim 1 which recites a slurry for chemical mechanical polishing (CMP), comprising a bulk solution and a plurality of nanoporous comprising particles is patentable over the cited art, as are claims dependent thereon. Applicants have made every effort to present claims which distinguish over the cited art, and it is believed that all claims are now in condition for allowance. However, Applicants request that

the Examiner call the undersigned if anything further is required by the Examiner prior to issuance of a Notice of Allowance for all claims.

Respectfully submitted,

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12

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